

S. A. M.

The Software Automatic Mouth

FOR THE ATARI 400/800

OWNER'S MANUAL



S. A. M.

The Software Automatic Mouth

**Written by
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**S.A.M. and Reciter programs
Documentation and packaging
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S.A.M. character designed by Gunnar Kullenberg



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INTRODUCTION

Congratulations!

You have just purchased S.A.M. — the Software Automatic Mouth — a versatile, high-quality speech synthesizer created entirely in software. You have added quality speech to your personal computer for a lower cost than ever before possible and, in the bargain, have gained features that other speech synthesizers cannot offer.

S.A.M. is designed to be easy to use. With a couple of simple program statements, you can add speech to your BASIC or assembly-language programs. When you have mastered the easy-to-learn phonetic alphabet, the inflection system, and the use of pitch and speed controls, you will be amazed at what you can make S.A.M. do. **And**, until then it will already match the performance of other speech synthesizers.

We strongly suggest that you read this manual carefully while learning to use S.A.M. There are thorough discussions of S.A.M.'s features with illustrative examples of how to implement them. There is also a dictionary of useful words and their phonetic equivalents to help you learn the phonetic spelling system.

Also remember that as a registered S.A.M. owner, you are entitled to our services in answering your S.A.M.-related questions, providing updates and improvements to the S.A.M. program at nominal cost, and helping you with your applications of S.A.M. Yes, this is a not-too-subtle hint that you should send in your S.A.M. owner registration card today. We look forward to hearing from you.

THE S.A.M. DISKETTE

The S.A.M. diskette contains several programs.

1. **The S.A.M. speech synthesis program —**

This program will boot in automatically and will leave your computer ready to accept speech input through BASIC or machine language programs. The program occupies about 9K bytes.

2. **RECITER —**

RECITER is the English text-to-speech program that interfaces the S.A.M. program with ordinary English text input. It is **not** used for phonetic input and must be loaded in separately (see instructions). It occupies about 6K bytes.

3. **SAYIT —**

A short BASIC program that allows you to type in strings of phonemes or text and hear them spoken immediately.

4. **DEMO —**

A BASIC program that demonstrates some of S.A.M.'s features by telling a short story.

5. **SPEECHES —**

Another BASIC program that features some familiar texts to be spoken aloud by S.A.M.

6. **GUESSNUM —**

A vocal version of the old guess-the-number-between-one-and-one-hundred game. Great for kids.

We suggest that you do not write additional data on the S.A.M. diskette. Remove it after loading the desired programs.

USING THE S.A.M. PROGRAMS

The S.A.M. program itself is a self-contained machine-language program that automatically boots in from the S.A.M. diskette when a system cartridge (e.g. BASIC or ASSEMBLER) is in the left slot. Programs using S.A.M. in the phonetic mode can be run immediately at this point.

In order to allow maximum working space in Atari memory, S.A.M. has been installed in a location that conflicts with some functions of the Atari DOS 2.0S operating system. In particular, when the DOS menu must be accessed, such as to load the RECITER program or the RS232 handler, special care must be taken. We therefore ask you to take the following steps:

1. Format a blank diskette using DOS 2.0S (S.A.M. is **incompatible** with other versions of DOS) and write the DOS files to the disk with the "H" option in DOS. **DO NOT** use the DOS from the S.A.M. disk to create the copy disk; use DOS from another disk.
2. Copy the programs from the S.A.M. diskette onto this new disk using the "O" (duplicate file) command followed by *.* to copy all the files (the "J" command will not work). The S.A.M. program will **not** be transferred to the new disk.
3. Make sure there is a MEM.SAV file on your copy disk and always leave it **un-write-protected**.
4. To use S.A.M. in conjunction with DOS, boot the S.A.M. disk. Then remove it and place the copy disk you have created into your drive. Then type "DOS" to enter the DOS menu. You can now load machine language files such as RECITER via the "L" command in DOS. Just remember that in order to use DOS with S.A.M. in the system, there **must** be a MEM.SAV on the disk. To return to BASIC after loading in a file, use the "B" command. (See the DOS 2.0S manual for further information on the use of MEM.SAV.)

We have included a S.A.M.-and-RECITER-compatible bootstrap for the RS232C handler on the S.A.M. diskette. Binary load it from DOS exactly as you do with RECITER if you need to use the RS232 interface along with S.A.M.

The RS232 handler provided will only function if RECITER is already loaded in. It will not work with S.A.M. alone.

RUNNING THE DEMO PROGRAMS

Once S.A.M. is loaded into memory, you can run all four demo programs on the S.A.M. disk (SAYIT, DEMO, SPEECHES, and GUESSNUM). These are all Atari BASIC programs and run from the usual BASIC "RUN" command. To operate SAYIT with English input, make sure you have binary-loaded RECITER as well.

USING S.A.M. FROM ATARI BASIC

S.A.M. patches into Atari BASIC by the use of the reserved string variable named SAM\$ (easy to remember).

Two BASIC statements are all that are required to make S.A.M. speak. The following statements inserted anywhere in an Atari BASIC program will cause S.A.M. to speak the phrase "I am a computer".

```
100 SAM$ = "AY4 AEM AH KUMPYUW3TER."  
110 A =USR (8192)
```

By using Atari BASIC'S string handling capabilities, it is possible to generate the SAM\$ string from sentence fragments, data statements, text files, etc. Just make sure the SAM\$ string is DIMensioned in your program (it can be DIMensioned no more than 255 characters long). The GUESSNUM program listed in this manual illustrates some of the techniques of using S.A.M. in BASIC.

SOME ADDITIONAL NOTES:

1. To avoid stepping on S.A.M. with your Atari BASIC program, do not make any changes in the value of LOWMEM.
2. S.A.M. makes use of the "zero" sound register in the Atari (location \$D201). You may use the other three sound registers undisturbed during vocal output. S.A.M. has no effect on Atari graphics modes other than using up memory that might be needed for large programs requiring high resolution (e.g. GR.8) graphic display.
3. S.A.M. disables interrupt requests and shuts down the ANTIC chip during vocal output. Therefore, the screen will blank out and the BREAK key will not operate while S.A.M. is speaking. See the Technical Notes for more details.

USING RECITER FROM ATARI BASIC

To use RECITER from Atari BASIC, follow this procedure:

1. Boot S.A.M. in from the S.A.M. diskette.
2. Enter DOS from a disk containing MEM.SAV and RECITER (see page 6).
3. Type "L" for Binary Load.
4. Type "RECITER".
5. When the DOS prompt returns, type "B" to get back into BASIC.
6. You are ready to use RECITER in your programs or in SAYIT.

Using RECITER from Atari BASIC is the same as using S.A.M. in his phonetic mode. However, this time the string SAM\$ is in plain English. Also the calling address is different.

```
100 SAM$ = "I AM A COMPUTER."
```

```
110 A = USR(8199)
```

Use of punctuation with RECITER is discussed later, but note that a dash will be treated as a pause-making dash only if there is non-letter (not A-Z) on both sides of it. Examples: the dash in "YOU ARE A RAT-FINK" will not pause, but the dash in "HELLO JIM - THIS IS ANN" will.

USE OF S.A.M. AND RECITER FROM MACHINE LANGUAGE

This is very similar to using S.A.M. from Atari BASIC except for one change; you must do your own string handling. A string of ATASCII characters (the same ones you would use in BASIC) is moved into locations \$2014- 2113. The first character must be in \$2014 and the last character, an \$9B return character, marks the string's end. Bytes after the \$9B are not read by S.A.M. Following the string definition, a JSR \$2004 is done and S.A.M. speaks. The use of RECITER is the same except that you do a JSR \$200B instead.

THE RECITER PROGRAM

RECITER is an English text-to-speech program that converts ordinary text into phonemes that S.A.M. can understand. You simply supply output strings of 256 characters or less to the program. RECITER takes care of the rest.

The program uses about 450 rules to convert English into S.A.M.'s phonetic language. Included among these rules are some stress markers for situations where the stress choice is unambiguous. In addition, S.A.M.'s usual punctuation rules still operate with some additional symbols ("!", ";", and ":") being considered as periods. The net result is that even directly-translated English text has a fair amount of inflection.

RECITER also recognizes a number of special characters. Numbers are read aloud, and several others are pronounced as well. If a character is not understood by RECITER, it simply isn't passed to S.A.M.

We recommend use of RECITER (or any text-to-speech program, for that matter) only for applications where the user has no control of the text. For example, text already in a file, text received over a MODEM, and text supplied by users unfamiliar with the phonetic system. Where the highest quality speech with full inflection is desired, we urge you to use S.A.M.'s phonetic system.

Don't be discouraged, though. You will find that RECITER will do a better job of speaking from English text than other text-translator products.

THE SAYIT PROGRAM

SAYIT is a short BASIC program that allows you to test many of S.A.M. and RECITER's features by directly inputting the string SAM\$.

If both S.A.M. and RECITER have been loaded in, you may opt for English input when running the program.

Typing "ctrl-N" will allow you to input new pitch and speed values to test these features. Once you have done so, the new pitch and speed will remain until you type "ctrl-N" again.

PHONETIC INPUT TO S.A.M.

I. THE PHONETIC SPELLING SYSTEM

S.A.M. is equipped with a version of the easy-to-learn, very readable International Phonetic Alphabet. There are about fifty phonemes which will let you spell all the words in English. Some sounds from foreign languages are not available in the system at this time.

Why use the phonetic system? There are two compelling reasons. 1.) In the phonetic system, all the words will be pronounced correctly; and 2.) You can put inflection into the speech however and wherever you want it.

If you have already tried the RECITER text-to-speech program, you know that it does a fair job of pronouncing English words. However, it does make mistakes. Some words sound a little strange and others are difficult to understand. The reasons for this are not hard to understand. English is a language of exceptions rather than rules; words that are spelled alike are pronounced differently ("have" vs. "gave"). A rule system like RECITER cannot pronounce all words correctly unless it stores an enormous dictionary that takes up vast amounts of memory. But the second flaw in text-to-speech conversion is more serious. Such a rule system cannot decide where the stress belongs in what is being said. The phonetic system in S.A.M., on the other hand, allows you to decide where to accent syllables within a word and where to stress words within a sentence.

So it is clear that the preferred way to make S.A.M. speak is with the phonetic alphabet. But how hard is it to use? It's really easier than writing in English because **you don't have to know how to spell!** You only have to know how to say the word in order to spell it phonetically.

Here is the complete list of phonemes, each presented with a sample word containing its sound. Note that there are many vowels, which is why they are all indicated by two letters rather than one.

The phonemes are classified into two categories: vowels and consonants. Among the vowels are the simple vowel sounds such as the "i" in "sit", the "o" in "slot", and the "a" in "hat". These vowels do not change their quality throughout their duration. There are also vowels called diphthongs such as the "i" in "site", the "o" in "slow", and the "a" in "hate", as well as the "oi" in "oil" and the "ow" in "how". These vowels start with one sound and end with another (e.g. "oi" glides from an "oh" sound to an "ee" sound).

The consonants are also divided into two groups: voiced and unvoiced. The voiced consonants require you to use your vocal chords to produce the sound. Such sounds as "b", "l", "n", and "z" sounds fall into this category. The unvoiced consonants, on the other hand, are produced entirely by rushing air and include such sounds as the "p", "t", "h", and "sh" sounds.

PHONETIC ALPHABET FOR S.A.M.

The example words have the **sound** of the phoneme, not necessarily the same letters.

VOWELS

IY	feet
IH	pin
EH	beg
AE	Sam
AA	pot
AH	budget
AO	talk
OH	cone
UH	book
UX	loot
ER	bird
AX	gallon
IX	digit

DIPHTHONGS

EY	made
AY	high
OY	boy
AW	how
OW	slow
UW	crew

The following symbols are used internally by some of S.A.M.'s rules, but they are also available to the user.

YX	diphthong ending
WX	diphthong ending
RX	R after a vowel
LX	L after a vowel
/X	H before a non-front vowel or consonant
DX	"flap" as in pity

VOICED CONSONANTS

R	red
L	allow
W	away
WH	whale
Y	you
M	Sam
N	man
NX	song
B	bad
D	dog
G	again
J	judge
Z	zoo
ZH	pleasure
V	seven
DH	then

UNVOICED CONSONANTS

S	Sam
SH	fish
F	fish
TH	thin
P	poke
T	talk
K	cake
CH	speech
/H	ahead

SPECIAL PHONEMES

UL	settle (= AXL)
UM	astronomy (= AXM)
UN	function (= AXN)
Q	kitt-en (glottal stop)

Note: The symbol for the "H" sound is **/H**. A glottal stop is a forced stoppage of sound.

On the phoneme chart, you will notice six phonemes — YX, WX, RX, LX, /X, and DX — which are described as being used by S.A.M.'s rule system. However, they have been provided with letter codes so that you may experiment with these special sounds directly. YX and WX are weaker versions of Y and W. RX and LX are smooth gliding versions of R and L. /X is the “h” sound in “who”, and DX is the quick flap of the tongue on the upper palate as in the word “pity”.

We are now ready to transcribe ordinary speech into its phonetic representation. Let's use the following sentence as an example:

I do my calculations on the computer.

The first step is to say each word aloud and decide how many syllables are in the word. a syllable has **one** vowel phoneme and its associated consonants (if any). We then identify the proper vowel phoneme by comparing its sound to the sounds listed in the table, and do the same for the consonants. The resultant combination of phonemes is the phonetic representation of the syllable. We do this for each syllable in a word.

In our example, the first word — “I” — is a single phoneme, the diphthong “AY”. The next word — “do” — is a single syllable comprised of the diphthong “UW” preceded by the voiced consonant “D”. The phonetic spelling is therefore “DUW”. Similarly, the third word — “my” — again uses the “AY” sound, this time preceded by an “M”, resulting in “MAY”.

The word “calculations” has four syllables. The first syllable transcribes as “KAEL”.

The “c” sound is pronounced as “k”, unlike the “s” pronunciation in a word like “cell” (notice there is no “C” in the phoneme table). The next syllable — “cu” — transcribes as “KYUW”. Note here that the “Y” sound prevents this syllable from being pronounced as “coo”. The third syllable comes out as “LEY”, and the fourth becomes “SHAXNZ”. This word ends with a voiced sound “Z” and not the hissy “S” sound as in “list”. You will rapidly discover that many words contain the phonetic combinations “AXL”, “AXM”, and “AXN”. To enhance the readability of the phonetic spelling, the special symbols “UL”, “UM”, and “UN” can be substituted for these combinations. The “tions” syllable is now written as “SHUNZ”. So, “calculations” becomes “KAELKYUWLEYSHUNZ”.

The next word “on” becomes “AAN”, and “the” becomes “DHAX”. By the way, if the word “the” precedes a word beginning with a vowel, it gets pronounced “thee” and is spelled “DHIY”. You should also notice that the “th” letter combination has two phonetic representations: unvoiced (TH) as in “thin”, or voiced (DH) as in “the”.

By now, the steps used in getting from “computer” to “KUMPYUWTER” should already be obvious. Try it.

Once you get used to the phonetic system, it will seem very easy and obvious. Initially, there will be some spellings that seem tricky (did you know that "adventure" has a "CH" in it?). However, the rule is always to write the word the way you **say** it, not the way you spell it.

To help you learn the system fast, we have provided an English-to-phonetic spelling dictionary of almost 1500 words. Many common words are in the dictionary; some unusual ones are in it as well. If you are really stuck on how to spell a word that isn't in the dictionary, think of another word that sounds like it and that one may be listed.

In any case, don't hesitate to experiment with the phonetic spelling system. Let your ears be your guide. This system is easy to learn, easy to use, easy to read, and you will be amazed at what you can do with it.

II. ADDING STRESS TO S.A.M.'S SPEECH

In the phonetic mode, S.A.M. is capable of speaking with a great deal of inflection and emphasis. This gives a much more natural and understandable quality to the speech than is otherwise possible.

The stress system for S.A.M. is particularly easy to use. There are eight stress markers that can be used simply by inserting a number (1-8) **after** the vowel to be stressed. For example, the monotonic pronunciation of the word "hello" produced by the phonetic spelling "/HEHLOW" becomes a much friendlier sounding greeting when spelled "/HEH3LOW".

Why do **you** have to put in the stress markers? Simply because they can go **anywhere** and S.A.M. has no way of knowing where you **want** them to go. The following simple example will demonstrate this point to you. Use the SAYIT program on your S.A.M. disk to hear the following sample phrases.

We will have S.A.M. say

"Why should I walk to the store?"

in a number of different ways.

1. WAY2 SHUH7D AY WAO5K TUX DHAH STOHR.
(You want a reason to do it.)
2. WAY7 SHUH2D AY WAO7K TUX DHAH STOHR.
(You are reluctant to go.)
3. WAY5 SHUH7D AY2 WAO7K DHAH STOHR.
(You want someone else to do it.)
4. WAY5 SHUHD AY7 WAO2K TUX7 DHAH STOHR.
(You'd rather drive.)
5. WAY5 SHUHD AY WAO5K TUX DHAH STOHR2OH7R.
(You want to walk somewhere else.)

Each of these stress examples has a slightly different meaning, even though the words are all the same. Stress markers give you the ability to let S.A.M. be expressive.

What do the stress markers do? The number you type tells S.A.M. to raise (or lower) his pitch and elongate the associated vowel sound.

The number system works like this:

- 1 = very emotional stress
- 2 = very emphatic stress
- 3 = rather strong stress
- 4 = ordinary stress
- 5 = light stress
- 6 = neutral (no pitch change) stress
- 7 = pitch-dropping stress
- 8 = extreme pitch-dropping stress

When should you use each of these? It all depends on how you want S.A.M. to sound. Say the words to yourself as expressively as you can and see where **your** voice rises and falls. Remember, the smaller the number, the more extreme the emphasis will be. Also, the stress markers will help get difficult words pronounced correctly. If some syllable is not enunciated sufficiently, put in a neutral stress marker.

A general rule is that the most important word or words in a sentence get the most stress and the rest of the words get little or no stress. However, words of more than one syllable should have stress marked on their accented syllables (most dictionaries show which these are if you are uncertain).

We will now assign stresses to our first example sentence about doing calculations on the computer. The first word "AY" is usually an important word (can you think of anyone more important?). We will write it as "AY4", assigning ordinary stress. "DUW", the only verb, is also important. We'll try "DUW4". "MAY" isn't very strong (unless you want to draw attention to it) and it is a single syllable, so we will leave it alone. "KAELKYUWLEYSHUNZ" is polysyllabic so we **must** identify the accented syllables. It is also the most important word in the sentence so it will have the strongest stress. "LEY" has the primary stress and "KAEL" receives the secondary stress, so we will write "KAE4LKYUWLEY3SHUNZ". "AAN" and "DHAX" are short, unstressed words. "KUMPYUWTER" has a single accent on "PYUW" and gets written "KUMPYUW4TER". So, our original sentence gets written

AY4 DUW4 MAY KAE4LKYUWLEY3SHUNZ AAN DHAX KUMPYUW4TER.

Try typing it into the SAYIT program compared to the unstressed version.

How about really unusual stress? When you place extraordinary emphasis on a word, you do so by elongating its vowel sounds. S.A.M. can do the same thing. For example, a call for help can become "/HEH5EH4EH3EH2EH3EH4EH5EHLP." You can always do this with the ordinary vowel sounds, but be careful with the diphthongs. They are complex sounds and if you repeat them, they will not do what you want (e.g. "OYOYOYOYOYOY" sounds just like it reads in English). To extend the diphthong sounds, you need to break them into component parts. So "OY" can be extended with "OH OH IY IY IY", and "AY" can be extended with "AAAA IY IY IY". You should experiment to find out just what you can do.

Unlike many other speech synthesis systems, S.A.M. allows you to control consonant stresses directly. This is usually done to produce a special tonal pattern in a word. Sometimes you might want a pitch rise on the final phoneme occurring just before a comma. For example, try typing: "AY4 YUWZ SAE5M3, AE4ND RIYSAY4TER." Notice how the pitch rises on the "M". It is never necessary to specify stress for a consonant occurring immediately before a stressed vowel. This is handled automatically.

Try to become familiar with the stress marker system. It makes all the difference between an ordinary speech synthesizer and the very expressive S.A.M.

III. THE EFFECTS OF PUNCTUATION

S.A.M. understands four punctuation marks. They are the hyphen, comma, period, and question mark.

The hyphen (-) serves to mark clause boundaries by inserting a short pause in the speech. It also has other uses to be discussed later. The comma marks phrase boundaries and inserts a pause approximately double that of the hyphen. The question-mark and period mark the end of sentences. The period inserts a pause and also causes the pitch to fall. The question-mark also inserts a pause, but it causes the pitch to rise. Notice that not all questions should end with a question-mark (rising pitch), only those that require a yes-or-no answer. ("Are we hiking today?" rises; "Why are we going to the woods?" falls at the end and should be marked with a period).

IV. FINAL NOTES ON PHONETIC INPUT

S.A.M. is capable of speaking only 2.5 seconds of speech without a break (this is the size of his "breath"). If the string to be spoken exceeds this, S.A.M. will insert short breaks every 2.5 seconds. S.A.M. **always** breaks at punctuation marks in anticipation of the following phrase. So, if you don't like where S.A.M. broke up a phrase, you can specify your own breaks with hypens. An example of this is: "I use the telephone - to call out of town".

S.A.M. uses the spaces between words to make his sentence-breaking decisions.

If a single word requires more than 2.5 seconds to say, S.A.M. will not be able to insert his own breaks and will therefore be unable to say the word.

In summary, the procedures outlined above may seem complex, but this is because they were presented in fine detail. In reality, the steps become automatic and you will soon be able to type in phonetics almost as fast as you can type English text.

THE USE OF PITCH AND SPEED CONTROLS

S.A.M. is capable of speaking in a wide range of tones and at many different rates. Both pitch and speed controls are accessed by single POKES to memory locations.

The following chart shows the effects of different values in the pitch and speed registers.*

PITCH

POKE PITCH, N

N=

00-20	impractical
20-30	very high
30-40	high
40-50	high normal
50-70	normal
70-80	low normal
80-90	low
90-255	very low
default = 64	

SPEED

POKE SPEED, M

M=

0-20	impractical
20-40	very fast
40-60	fast
60-70	fast conversational
70-75	normal conversational
75-90	narrative
90-100	slow
100-225	very slow
default = 72	

*see the memory reference chart for these locations

WHAT AM I HEARING?

In recent years, many new speech synthesizers have appeared in the marketplace. The techniques they use vary widely depending on the intended application. Most synthesizers found in consumer products, such as talking televisions or microwave ovens, use a "speech compression" technique of one sort or another. These techniques require a person to speak the needed words or entire sentences. The speech waveform is then "compressed" using a mathematical algorithm and, as a result, can then be stored in a memory chip without taking up a lot of room. The synthesizer's job is to then take this compressed speech information and expand it back into the original waveform. Some of these systems work quite well, retaining the speaker's intonation and sometimes even his or her identity. The processes used in such synthesizers differ greatly from those used in unlimited vocabulary synthesizers like S.A.M.

Let's follow the evolution of an unlimited vocabulary speech synthesizer. First, we must define the task. Simply, we want to create a system that will synthesize any English utterance. One way to begin would be to record every possible utterance on tape and just play back the right one whenever we need it. This would take up more tape or computer memory than could ever exist, so this method is obviously not too practical.

The next method might be to record all the English words and play them back in a specific order to create sentences. This is certainly practical. It would take up a large amount of memory, but it would work. However, we have lost something in this process. The words now sound disjointed because we have "spliced" the sentence together. Also, the stress or inflection pattern of the sentence is either wrong or non-existent. If we wanted an accurate stress pattern, we would need to record every word in a number of different styles, at different pitches, etc.

Such a system needs too much memory. So, let's break things down even further and try to store as little as possible in memory. Instead of storing sentences or words or even syllables, we could store phonemes. Phonemes are the atoms of spoken language, the individual speech sounds. It turns out that English has a little over forty of them. Wow — this takes up practically no memory at all! We could specify the phonemes in the order we need to create words and sentences and really have ourselves a system. So, we go and record the phonemes and play them back to say the sentence, "I am a computer." Why can we barely understand it? It seems we have broken things down a bit too far. When we chop the words down to this level and then try to reassemble them, everything that blends one sound into another is lost and the results are nothing less than horrible.

But all is not lost. Our efforts are not wasted because we have the acoustic-phonetician to come to our rescue. These people deal in the study of speech sounds and they can tell us just how to repair our phoneme-based system. First, instead of recording the actual speech waveform, we only store the frequency spectrums. By doing this, we save memory and pick up other advantages. Second, we learn that we need to store some data about timing. These are numbers pertaining to the duration of each phoneme under different circumstances, and also some data on transition times so we can know how to blend a phoneme into its neighbors. Third, we devise a system of rules to deal with all this data and, much to our amazement, our computer is babbling in no time.

The advantages in synthesizing speech in this way are tremendous. We use very little memory for all the data and the rules to use that data, and we also gain the ability to specify inflection, timing, and intonation. This is because we have not stored actual speech sounds, only their spectrums. (You can think of this as a printer needing only four colors of ink to reproduce all the colors in a picture.)

Now, in actuality, we do not store all the spectrums, but only those that are targets. Each phoneme has associated with it a target spectrum which can be specified with very little data. The target may be thought of as a "frozen" speech sound, the sound you would be making if your mouth was frozen exactly in the middle of pronouncing the phoneme. The timing rules tell the synthesizer how to move from target to target in a manner that imitates the timing of a human talker.

S.A.M. is this type of synthesizer implemented entirely in software. It has the tables of phoneme spectra and timing, together with the rules for using this data to blend the sounds together into any English utterance we may have in mind. We have traded some quality from the method using all the recorded words, but what we have gained is versatility, practicality, and the ability to do it all in real time, with very little memory usage, on an inexpensive microcomputer.

ENGLISH-TO-PHONETIC SPELLING DICTIONARY

- A -

abandon = AHBAE4NDUN
 ability = AHBIH4LIXTIY
 able = EY4BUL
 abort = AHBOH4RT
 about = AHBAW4T
 above = AHBAH4V
 absolute = AE5BSOHLUW4T
 abuse = AHBYUW4S
 accelerate = EHKSEH4LEREYT
 accent = AE4KSEHNT
 accept = AEKSEH4PT
 access = AE4KSEHS
 accident = AE4KSIXDEHNT
 account = AHKAW4NT
 acknowledge = EHKNA4LIHJ
 action = AE4KSHUN
 active = AE4KTIHV
 address = AE4DREHS
 adjust = AHJAH4ST
 adult = AHD4H4LT
 advance = EHDVAE4NS
 adventure = AEDVEH4NCHER
 affair = AHFEY4R
 afford = AHFOH4RD
 after = AE4FTER
 age = EY4J
 agree = AHGRIY4
 air = EH4R
 airplane = EH4RPLEYN
 alarm = AHLAA4RM
 algebra = AE4LJAXBRAH
 alien = EY4LIYIXN
 allow = AHLAW4
 alone = AHLOW4N
 along = AHLAO4NX
 alphabet = AE4LFAXBEHT
 alternate = AO4LTERNIXT
 America = AHMEH4RIXKAH
 among = AHMAH4NX
 analysis = AHNAE4LIXSIXS
 and = AE4ND
 anger = AE4NXGER
 announce = AHNAW4NS
 answer = AE4NSER
 antenna = AENTEH4NAH
 anticipate = AENTI4H4SIXPEYT
 apology = AHPAA4LAXJIY
 appear = AHPIY4R
 apple = AE4PUL
 appropriate = AHPROH4PRIYIXT

approve = AHPRUW4V
 area = EH4RIYAH
 arm = AA4RM
 arrive = AHRAY4V
 ask = AE4SK
 assumption = AHS4H4MPSHUN
 astronomy = AHSTRAA4NUMIY
 Atari = AHTAA4RIY
 atom = AE4TUM
 attack = AHTAE4K
 audio = AO4DIYOW
 authority = AHTHOH4RIXTIY
 automatic = AO5TUMAE4TIXK
 auxiliary = AOKZIH4LYERIY
 available = AHVEH4LAXBUL

- B -

baby = BEY4BIY
 back = BAE4K
 bad = BAE4D
 balance = BAE4LIXNS
 bank = BAE4NXX
 bargain = BAA4RGUN
 base = BEY4S
 basic = BEY4SIHK
 battle = BAE4TUL
 beam = BIY4M
 beautiful = BYUW4TIXFUHL
 behave = BIY/HEY4V
 belief = BIXLIY4F
 beneficial = BEH4NAXFIH4SHUL
 betray = BIYTREY4
 better = BEH4TER
 bible = BAY4BUL
 bibliography = BIH5BLIYAA4GRAXFIY
 bicycle = BAY4SIXKUL
 billion = BIH4LYUN
 binary = BAY4NEHRIY
 bite = BAY4T
 black = BAE4K
 blast = BLAE4ST
 block = BLAA4K
 blood = BLAH4D
 board = BOH4RD
 bomb = BAA4M
 book = BUH4K
 boot = BUW4T
 boss = BAO4S
 bottle = BAA4TUL
 bottom = BAA4TUM
 box = BAA4KS

boy = BOY4
brain = BREY4N
branch = BRAE4NCH
break = BREY4K
brief = BRIY4F
bring = BRIH4NX
broken = BROW4KIXN
brother = BRAH4DHER
budget = BAH4JIXT
buffer = BAH4FER
bug = BAH4G
bureau = BYER4OW
burglar = BER4GULER
bus = BAH4S
business = BIH4ZNIXS
busy = BIH4ZIY
by = BAY4
byte = BAY4T

- C -

cabinet = KAE4BUNIXT
cable = KEY4BUL
calculate = KAE4LKYAXLEYT
calendar = KAE4LUNDER
call = KAO4L
calorie = KAE4LERIY
cancel = KAE4NSUL
candy = KAE4NDIY
can't = KAE4NT
capacity = KAXPAE4SIXTIY
captain = KAE4PTIXN
capture = KAE4PCHER
card = KAA4RD
careful = KEH4RFUHL
carry = KEH4RIY
cartridge = KAA4RTRIXJ
case = KEY4S
cashier = KAE4SHIY4R
cassette = KAXSEH4T
catalog = KAE4TULAOG
celebrate = SEH4LAXBREYT
celestial = SULEH4SCHIYUL
Celsius = SEH4LSIYAXS
center = SEH4NTER
certain = SER4TQN
challenge = CHAE4LIXNJ
change = CHEY4NJ
channel = CHAE4NUL
chapter = CHAE4PTER
charge = CHAA4RJ
chauvenism = SHOH4VIXNIHZUM

cheap = CHIY4P
cheese = CHIY4Z
child = CHAY4LD
children = CHIH4LDRIXN
chocolate = CHAO4KLIXT
choreography = KOH5RIYAA4GRAXFIY
Christmas = KRIH4SMAXS
church = CHER4CH
cinema = SIH4NUMAH
circle = SER4KUL
circuit = SER4KIXT
circumstance = SER4KUMSTAENS
citizen = SIH4TIXSUN
city = SIH4TIY
classify = KLAE4SIXFAY
clear = KLIY4R
close = KLOW4Z
coaxial = KOHAE4KSIYUL
coffee = KAO4FIY
coherent = KOW/HEH4RIXNT
cold = KOW4LD
college = KAA4LIXJ
color = KAH4LER
comfortable = KAH4MFTERBUL
command = KUMAE4ND
common = KAA4MUN
company = KAHM4PUNIIY
complain = KUMPLEY4N
complex = KUMPLEH4KS
component = KAHMPOH4NUNT
computer = KUMPYUW4TER
condition = KUNDIH4SHUN
conscience = KAA4NSHUNTS
console = KAA4NSOHL
control = KUNTROH4L
conversation = KAA5NVERSEY4SHUN
coordinate = KOHWOH4DUNIXT
corporation = KOH5RPEREY4SHUN
correction = KOHREH4KSHUN
count = KAW4NT
country = KAH4NTRIY
cousin = KAH4ZIXN
create = KRIY4Y4T
critical = KRIH4TIXKUL
culture = KAH4LCHER
curious = KYUH4RIYAXS

- D -

danger = DEY4NJER
data = DEY4TAH
decay = DIXKEY4

decide = DIXSAY4D
 decibel = DEH4SIXBUL
 decrease = DIYKRIY4S
 definition = DEH5FUNIH4SHUN
 degree = DIXGRIY4
 delay = DIXLEY4
 demonstrate = DEH4MUNSTREYT
 department = DIYPAA4RTMIXNT
 desire = DIXZAY4ER
 develop = DIXVEH4LAHP
 dictionary = DIH4KSHUNEHRİY
 different = DIH4FRIXNT
 discount = DIH4SKAWNT
 distance = DIH4STIXNS
 distribution = DIH5STRAXBYUW4SHUN
 division = DIXVIH4ZHUN
 doctor = DAA4KTER
 double = DAH4BUL
 down = DAW4N
 drive = DRAY4V
 dungeon = DAH4NJUN

- E -

earth = ER4TH
 easy = IY4ZIY
 economics = IY5KUNAA4MIXKS
 education = EH5JUWKEY4SHUN
 either = IY4DHER
 eject = IXJEH4KT
 electricity = ULEHKTRIH4SIXTIY
 electronic = ULEHKTRAA4NIXK
 elementary = EH4LUMEH4NTRIY
 emphasis = EH4MFAXSIHS
 encyclopedia = EHNSAY5KLAXPIY4DIYAH
 energy = EH4NERJIY
 engineering = EH5NJUNIY4RIHNX
 enter = EH4NTER
 enunciate = IYNAH4NSIYEY
 equal = IY4KWUL
 erase = IXREY4S
 error = EH4ROHR
 escape = EHSKEY4P
 estimate = EH4STUMIXT
 Europe = YUH4RAXP
 evil = IY4VUL
 exciting = EHKSAY4TIHNX
 explain = EHKSPLEY4N
 expression = EHKSPREH4SHUN
 extra = EH4KSTRAH

- F -

face = FEY4S
 fail = FEY4L
 Fahrenheit = FEH4RIXN/HAYT
 false = FAO4LS
 family = FAE4MULIY
 fast = FAE4ST
 fatal = FEY4TUL
 father = FAA4DHER
 fault = FAO4LT
 female = FIY4MEYL
 fight = FAY4T
 figure = FIH4GYER
 file = FAY4L
 filter = FIH4LTER6
 finance = FAY4NAENS
 find = FAY4ND
 finger = FIH4NXGER
 finish = FIH4NIXSH
 fire = FAY4ER
 first = FER4ST
 flavor = FLEY4VER
 flight = FLAY4T
 flow chart = FLOW4CHAART
 flower = FLAW4ER
 fluorescent = FLUHREH4SIXNT
 focus = FOW4KAXS
 follow = FAA4LOW
 foot = FUH5T
 force = FOH4RS
 formula = FOH4RMYUXLAH
 forward = FOH4RWERD
 fraction = FRAE4KSHUN
 fragile = FRAE4JUL
 freedom = FRIY4DUM
 frequency = FRIY4KWUNSIY
 from = FRAH4M
 fuel = FYUW4L
 full = FUH4L
 function = FAH4NXKSHUN
 fundamental = FAH5NDUMEH4NTUL
 fuse = FYUW4Z
 fusion = FYUWSZHUN
 future = FYUW4CHER

- G -

gain = GEY4N
 galaxy = GAE4LAXKSIY
 game = GEY4M
 garbage = GAA4RBIXJ

gasoline = GAE4SULIYN
gate = GEY4T
general = JEH4NERUL
generate = JEH4NEREYT
genius = JIY4NYAXS
gentle = JEH4NTUL
genuine = JEH4NUYXIXN
geometry = JIYAA4MIXTRIIY
get = GEH4T
giant = JAY4IXNT
gift = GIH4FT
glass = GLAE4S
gnome = NOW4M
go = GOW4
gold = GOH4LD
good = GUH4D
gourmet = GUHRMEY4
government = GAH4VERNMEHNT
grand = GRAE4ND
graphic = GRAE4FIXK
gravity = GRAE4VIXTIY
ground = GRAW4ND
guarantee = GAE4RIXNTIY4
guide = GAY4D
gun = GAH4N
gyroscope = JAY4RAXSKOWP

- H -

habit = /HAE4BIT
hacker = /HAE4KER
hair = /HEH4R
half = /HAE4F
hallucination = /HULUW4SIXNEY5SHUN
hand = /HAE4ND
happy = /HAE4PIY
hardware = /HAA4RDWEHR
harmony = /HAA4RMUNIY
have = /HAE4V
head = /HEH4D
heart = /HAA4RT
helicopter = /HEH4LIXKAAPTER
hello = /HEH4LOW
here/ = /HIY4R
hero = /HIY4ROW
herta = /HER4TS
hesitate = /HEH4ZIXTEY6T
hexadecimal = /HEH5KSIXDEH4SUMUL
high = /HAY4
history = /HIH4STERIY
hobby = /HAA4BIY
hold = /HOW4LD

home = /HOW4M
honest = AA4NIXST
horoscope = /HOH4RAXSKOWP
hospital = /HAA4SPIXTUL
hour = AW4ER
house = /HAW4S
however = /HAWEH4VER
huge = /HYUW4J
human = /HYUW4MUN
humor = /HUYW4MER
husband = /HAH4ZBUND
hyper = /HAY4PER
hypothesis = /HAYPAA4THAXSIHS

- I -

I = AY4
ice = AY4S
idea = AYDIY4AX
identical = AYDEH4NTIXKUL
identity = AYDEH4NTIXTIY
illusion = IHLUX4ZHUN
image = IH4MIXJ
imagination = IHMAE4JIXNEY5SHUN
immobilize = IXMOH4BULAYZ
important = IHMPOH4RTUNT
in = IH4N
inch = IHN4CH
included = IHNKLUX4DIXD
income = IH4NKUM
inconvenient = IHN5KUNVIY4NYUNT
increase = IHNKRIY4S
indeed = IHNDIY4D
index = IH4NDEHKS
indicate = IH4NDIXKEYT
indirect = IH5NDEREH4KT
individual = IH5NDIXVIH4JUWUL
industry = IH4NDAHSTRIY
inferior = IHNFIH4RIYER
inflation = IHNFLEY4SHUN
influence = IH4NFLUWIXNS
information = IH5NFERMEY4SHUN
-ing = IHNX
inject = IHNJEH4KT
injure = IH4NJER
initial = IXNIH4SHUL
inside = IHNSAY4D
inspect = IHNSPEH4KT
insulator = IH4NSULEYTER
integer = IH4NTIXJER
intelligent = IHNTEH4LIXJIXNT
interest = IH4NTREHST

interference = IH4NTERFIY4RIXNS
intermittent = IH4NTERMIH4TNNT
invader = IHNVEY4DER
invent = IHNVEH4NT
inverse = IH4NVERS
involve = IHNVA44LV
iron = AY4ERN
irrational = IHRAE4SHUNUL
isolate = AY4SULEYT
issue = IH4SHUW
item = AY4TUM

- J -

jacket = JAE4KIXT
jam = JAE4M
jargon = JAA4RGUN
jazz = JAE4Z
jiffy = JIH4FIY
job = JAA4B
join = JOY4N
joke = JOW4K
judge = JAH4J
jump = JAH4MP
junction = JAH4NXKSHUN
junior = JUW4NYER
just = JAH4ST
jail = JEY4L
jewelry = JUW4LRIY
journey = JER4NIY
jungle = JAH4NXGUL
junk = JAH4NXK

- K -

keep = KIY4P
key = KIY4
keyboard = KIY4BOHRD
kilobyte = KIH4LAXBAYT
kind = KAY4ND
kingdom = KIH4NXGDUM
knight = NAY4T
knowledge = NAA4LIXJ

- L -

label = LEY4BUL
lady = LEY4DIY
language = LAE4NXGWIXJ
large = LAA4RJ
laser = LEY4ZER
last = LAE4ST

late = LEY4T
laugh = LAE4F
launch = LAO4NCH
law = LAO4
layer = LEY4ER
lead = LIY4D
lease = LIY4S
lecture = LEH4KCHER
left = LEH4FT
legal = LIY4GUL
legend = LEH4JIXND
leisure = LIY4ZHER
length = LEH4NTH
letter = LEH4TER
level = LEH4VUL
liberal = LIH4BERUL
life = LAY4F
lift = LIH4FT
light = LAY4T
like = LAY4K
limit = LIH4MIXT
linear = LIH4NIYER
liquid = LIH4KWIXD
list = LIH4ST
listen = LIH4SIXN
literature = LIH4TERIXCHER
little = LIH4TUL
load = LOW4D
local = LOW4KUL
location = LOWKEY4SHUN
lock = LAA4K
logarithm = LAO4GERIH5DHUM
logical = LAA4JIHKUL
long = LAO4NX
look = LUH4K
loop = LUW4P
lose = LOW4Z
love = LAH4V
low = LOW4
loyal = LOY4UL
luminescence = LUW4MIXNEH5SIXNS
lunatic = LUW4NAXTIH6K
luxury = LAH4GZHERIY

- M -

machine = MAXSHIY4N
madam = MAE4DUM
made = MEY4D
magazine = MAEGAXZIY4N
magic = MAE4JIHK
magnet = MAE4GNIXT

magnitude = MAE4GNIHTUX5D
 mail = MEY4L
 main = MEY4N
 major = MEY4JER
 make = MEY4K
 malfunction = MAE5LFAH4NXKSHUN
 man = MAE4N
 manager = MAE4NIXJER
 maneuver = MUNUW4VER
 manipulate = MUNIH4PYUHLEYT
 manual = MAE4NYUWUL
 manufacture = MAE5NUYXFAE4KCHER
 many = MEH4NIY
 marginal = MAA4RJIXNUL
 market = MAA4RKIXT
 marriage = MEH4RIXJ
 mass = MAE4S
 master = MAE4STER
 mate = MEY4T
 material = MAXTIH4RIYUL
 mathematics = MAE4THUMAE5TIXKS
 mature = MAXCHUX4R
 maximum = MAE4KSIXMUM
 may = MEY4
 meaning = MUY4NIHNX
 measure = MEH4ZHER
 mechanical = MIXKAE4NIHKUL
 mechanism = MEH4KUNIHZUM
 media = MIY4DIYAH
 medical = MEH4DIXKUL
 medium = MIY4DIYUM
 member = MEH4MBER
 memory = MEH4MERIY
 mental = MEH4NTUL
 menu = MEH4NYUW
 merchandise = MER4CHUNDAY5S
 merge = MER4J
 metal = MEH4TUL
 meter = MIY4TER
 method = MEH4THIXD
 micro = MAY4KROW6
 middle = MIH4DUL
 might = MAY4T
 mile = MAY4L
 military = MIH4LIXTEH6RIY
 million = MIH4LYUN
 mind = MAY4ND
 mineral = MIH4NERUL
 miniature = MIH4NIYAXCHER
 minimum = MIH4NIXMUM
 minus = MAY4NIXS
 miracle = MIH4RIXKUL

miscellaneous = MIH5SULEY4NIYAXS
 missile = MIH4SUL
 mister = MIH4STER
 mixture = MIH4KSCHER
 mnemonic = NIXMAA4NIXK
 model = MAA4DUL
 modulation = MAA4JULEY5SHUN
 molecule = MAA4LIXKYUWL
 moment = MOH4MIXNT
 money = MAH4NIY
 monitor = MAA4NIXTER
 monolithic = MAANULIH4THIXK
 monotone = MAA4NAXTOW6N
 month = MAH4NTH
 moon = MUW4N
 morning = MOH4RNIHNX
 most = MOW4ST
 mother = MAH4DHER
 motion = MOW4SHUN
 motor = MOW4TER
 mouth = MAW4TH
 move = MUW4V
 much = MAH4CH
 multiply = MAH4LTIX6PLAY
 murder = MER4DER
 muscle = MAH4SUL
 music = MYUW4ZIXK
 must = MAH4ST
 my = MAY4
 myself = MAYSEH4LF
 mystery = MIH4STERIY

- N -

naive = NAY5IY4V
 name = NEY4M
 narrate = NAE4REYT
 narrow = NAE4ROW
 natural = NAE4CHERUL
 nature = NEY4CHER
 navigate = NAE4VIXGEYT
 near = NIY4R
 need = NIY4D
 negative = NEH5GAXTIH6V
 negotiate = NIXGOW4SHIYEY
 neighborhood = NEY4BER/HUH6D
 nerve = NER4V
 neutral = NUX4TRUL
 news = NUW4Z
 nice = NAY4S
 night = NAY4T
 noise = NOY4Z

nomenclature = NOH4MIXNKLEY6CHER
 none = NAH4N
 normal = NOH4RMUL
 north = NOH4RTH
 nose = NOW4Z
 notation = NOHTEY4SHUN
 notice = NOW4TIXS
 nothing = NAH4THIHNX
 now = NAW4
 nuclear = NUX4KLIYER
 number = NAH4MBER

- O -

object = AA4BJEHKT
 obligation = AA5BLIXGEY4SHUN
 observe = AXBZER4V
 obvious = AA4BVIYAXS
 occational = AHKEY4ZHUNUL
 occupation = AA5KYUXPEY4SHUN
 ocean = OW4SHUN
 odd = AA4D
 of = AH4V
 off = AO4F
 offer = AO4FER
 office = AO4FIXS
 official = AHFIH4SHUL
 ogre = OW4GER
 ohm = OW4M
 oil = OY4L
 O.K. = OW4KEY
 old = OW4LD
 omen = OW4MUN
 on = AA4N
 open = OW4PUN
 operate = AA4PEREYT
 opinion = AHPIH4NYUN
 oppose = AHPOW4Z
 opposite = AA4PAXSIHT
 option = AA4PSHUN
 orbit = OH4RBIHT
 orchestra = OH4RKEHSTRAH
 order = OH4RDER
 ordinary = OH4RDIXNEHRIY
 organize = OH4GUNAYZ
 origin = OH4RIXJIXN
 oscillation = AA5SULEY4SHUN
 other = AH4DHER
 ought = AO4T
 out = AW4T
 outlet = AW4TLEHT
 output = AW4TPUHT

outside = AWT SAY4D
 over = OW4VER
 own = OW4N
 oxygen = AA4KSAXJIXN

- P -

pack = PAEP AE4K
 package = PAE4KIXJ
 page = PEY4J
 paint = PEY4NT
 pair = PEH4R
 palace = PAE4LIXS
 panel = PAE4NUL
 paper = PEY4PER
 parabola = PERAE4BULAH
 paradox = PAE4RAXDAA6KS
 parallel = PAE4RULEH6L
 paragraph = PAE4RAXGRAEF
 pardon = PAA4RDUN
 parent = PEH4RUNT
 parity = PAE4RITXIY
 park = PAA4RK
 part = PAA4RT
 particle = PAA4RTIXKUL
 particular = PAARTIH4KYUHLER
 pass = PAE4S
 patch = PAE4TCH
 pathetic = PAHTEH4TIXK
 pattern = PAE4TERN
 pause = PAO4Z
 pay = PEY4
 payroll = PEY4ROW6L
 peculiar = PIXKYUW4LYER
 penalty = PEH4NULTIY4
 penetrate = PEH4NAXTREY6T
 perception = PERSEH4PSHUN
 perfect = PER4FIXKT
 period = PIH4RIYIXD
 permanent = PER4MUNIXNT
 permission = PERMIH4SHUN
 person = PER4SUN
 personality = PER4SUNAE5LIXTIY
 perspective = PERSPEH4KTIXV
 pet = PEH4T
 phantom = FAE4NTUM
 phase = FEY4Z
 phenomenon = FUNAA4MIXNUN
 philosophy = FULAA4SAHFIY
 phoneme = FOW4NIYM
 photo = FOW4TOW
 physical = FIH4ZIXKUL

physics = FIH4ZIXKS
 piano = PYAE4NOW
 pick = PIH4K
 picture = PIH4KCHER
 pilot = PAY4LIXT
 pin = PIH4N
 pirate = PAY4RixT
 pistol = PIH4STUL
 pitch = PIH4TCH
 pity = PIH4TIY
 place = PLEY4S
 plan = PLAE4N
 planet = PLAE4NIXT
 plastic = PLAE4STIXK
 plausible = PLAO4ZAXBUL
 play = PLEY4
 please = PLIY4Z
 pleasure = PLEH4ZHER
 plectrum = PLEH4KTRUM
 plenty = PLEH4NTIY
 plot = PLAA4T
 plug = PLAH4G
 plus = PLAH4S
 poetry = POW4IXTRIY
 point = POY4NT
 poke = POW4K
 police = PULIY4S
 policy = PAA4LIXSIY
 polynomial = PAA5LIXNOH4MIYUL
 pop = PAA4P
 popular = PAA4PYULER
 population = PAA4PYULEY4SHUN
 port = POH4RT
 portable = POH4RTAXBUL
 positive = PAA4ZIXTIX6V
 position = PAXZIH4SHUN
 power = PAW4ER
 practice = PRAE4KTIHS
 precise = PRIXSAY4S
 prefer = PRIXFER4
 preliminary = PREIXLIH4MIXNEHRIY
 prepare = PRIXPEH4R
 present = PREH4ZIXNT
 press = PREH4S
 pressure = PREH4SHER
 prevent = PRIXVEH4NT
 primary = PRAY4MEHRIY
 primitive = PRIH4MIXTIX6V
 prince = PRIH4NS
 princess = PRIH4NSEHS
 print = PRIH4NT
 private = PRAY4VIXT

probably = PRAA4BAXBLIY
 problem = PRAA4BLUM
 proceed = PROHSIY4D
 process = PRAA4SEHS
 produce = PRAXDUW4S
 professional = PRAXFEH4SHUNUL
 professor = PRAHFEH4SER
 profit = PRAA4FIXT
 program = PROW4GRAEM
 project = PRAA4JEHKT
 promise = PRAA4MIHS
 pronounce = PRUNAW4NS
 proper = PRAA4PER
 proportional = PRAXPOH4RSHUNUL
 protect = PRAXTEH4KT
 proud = PRAW4D
 psychiatrist = SAYKAY4AXTRIX6ST
 public = PAH4BLIXK
 publish = PAH4BLIHS
 pull = PUH4L
 pulse = PAH4LS
 pure = PYUW4R
 push = PUH4SH
 put = PUH4T

- Q -

quality = KWAA4LIXTIY
 quantity = KWAA4NTIXTIY
 question = KWEH4SCHUN
 quick = KWIH4K
 quiet = KWAY4IXT
 quit = KWIH4T
 quiz = KWIH4Z
 quote = KWOW4T
 quotient = KWOW4SHUNT

- R -

race = REY4S
 radar = REY4DAAR
 radiation = REY5DIYEY4SHUN
 radio = REY4DIYOW
 radius = REY4DIYAHS
 rain = REY4N
 random = RAE4NDUM
 range = REY4NJ
 rare = REH4R
 rate = REY4T
 rather = RAE4DHER
 ratio = REY4SHIYOW
 reach = RIY4CH

reaction = RIYAE4KSHUN
 read = RIY4D
 realistic = RIY5LIH4STIXK
 reason = RIY4ZUN
 receive = RIXSIY4V
 reciter = RIXSAY4TER
 recognize = REH4KAXGNAYZ
 recommend = REH5KUMEH4ND
 record = REH4KERD
 recover = RIYKAH4VER
 rectangle = REH4KTAENXGUL
 reduce = RIXDUW4S
 refer = RIYFER4
 reference = REH4FERIXNS
 reflection = RIXFLEH4KSHUN
 refrigerator = RIXFRIH4JEREYTER
 region = RIY4JUN
 register = REH4JIXSTER
 regular = REH4GYUXLER
 reject = RIXJEH4KT
 relativity = REH5LAXTIH4VIXTIY
 relax = RIXLAE4KS
 relay = RIY4LEY
 release = RIXLIY4S
 relief = RIYLIY4F
 religion = RIXLUH4JUN
 remain = RIYMEY4N
 remember = RIXMEH4MBER
 remove = RIYMUX4V
 rent = REH4NT
 repeat = RIXPIY4T
 replace = RIXPLEY4S
 reply = RIXPLAY4
 report = RIXPOH4RT
 represent = REHPRIXZEH4NT
 reproduction = RIY5PRAXDAH4KSHUN
 republic = RIXPAH4BLIXK
 rescue = REH4SKYUW
 research = RIY4SERCH
 reserve = RIXZER4V
 resistance = RIXZIH4STUNS
 respect = RIXSPEH4KT
 response = RIXSPAA4NS
 rest = REH4ST
 restore = RIXSTOH4R
 retail = RIY4TEY6L
 return = RIXTER4N
 reverse = RIXVER4S
 review = RIXVYUW4
 revolution = REH5VULUXWSHUN
 rhapsody = RAE4PSAXDIY
 rhythm = RIH4DHUM

rich = RIH4CH
 ride = RAY4D
 ridiculous = RIXDIH4KYULAXS
 right = RAY4T
 rigid = RIH4JIXD
 ring = RIH4NX
 rise = RAY4Z
 river = RIH4VER
 road = ROW4D
 rocket = RAA4KIXT
 roll = ROH4L
 room = RUW4M
 rough = RAH4F
 round = RAW4ND
 rubber = RAH4BER
 rule = RUW4L
 run = RAH4N
 rush = RAH4SH

- S -

sabotage = SAE5BAXTAA6ZH
 sacrifice = SAE4KRIFAYS
 sad = SAE4D
 safe = SEY4F
 safety = SEY4FTIY
 saint = SEY4NT
 sale = SEY4L
 S.A.M. = SAE4M
 same = SEY4M
 sample = SAE4MPUL
 sanctuary = SAE4NXKCHUWEH6RIY
 sandwich = SAE4NWIXCH
 sarcasm = SAA4RKAEZUM
 satisfaction = SAE4TIXSFAE4KSHUN
 savage = SAE4VIXJ
 save = SEY4V
 say = SEY4
 scale = SKEY4L
 scandal = SKAE4NDUL
 scarce = SKEY4RS
 scatter = SKAE4TER
 scenic = SIY4NIXK
 schedule = SKEH4JYUWL
 scheme = SKIY4M
 scholar = SKAA4LER
 school = SKUW4L
 science = SAY4IHNS
 scientific = SAY4UNTIH5FIXK
 scientific = SAY4AXNTIH5FIXK
 scissors = SIH4ZERZ
 score = SKOH4R

scramble = SKRAE4MBUL
 scratch = SKRAE4CH
 scream = SKRIY4M
 screw = SKRUW4
 script = SKRIH4PT
 scroll = SKROW4L
 seal = SIY4L
 search = SER4CH
 season = SIY4ZUN
 second = SEH4KUND
 secret = SIY4KRIXT
 secretary = SEH4KRIXTEH5RIY
 section = SEH4KSHUN
 security = SIXKYUH4RIXTIY
 see = SIY4
 seek = SIY4K
 segment = SEH4GMIXNT
 self = SEH4LF
 sell = SEH4L
 semi- = SEH4MIY
 send = SEH4ND
 sensation = SEHNSEY4SHUN
 senior = SIY4NYER
 sense = SEH4NS
 sensible = SEH4NSIXBUL
 sensitive = SEH4NSIXTIX6V
 sentence = SEH4NTIXNS
 separate = SEH4PERIXT
 sequence = SIY4KWEHNS
 serial = SIH4RIYUL
 serious = SIH4RIYAH5
 serve = SER4V
 service = SER4VIXS
 session = SEH4SHUN
 set = SEH4T
 settle = SEH4TUL
 several = SEH4VERUL
 sex = SEH4KS
 shadow = SHAE4DOW
 shake = SHEY4K
 shame = SHEY4M
 shape = SHEY4P
 share = SHEY4R
 sharp = SHAA4RP
 she = SHIY4
 sheet = SHIY4T
 shield = SHIY4LD
 shift = SHIH4FT
 shock = SHAA4K
 shoot = SHUW4T
 shop = SHAA4P
 short = SHOH4RT
 should = SHUH4D
 show = SHOW4
 shy = SHAY4
 sick = SIH4K
 side = SAY4D
 sight = SAY4T
 sign = SAY4N
 signal = SIH4GNUL
 silent = SAY4LIXNT
 silver = SIH4LVER
 similar = SIH4MULER
 simple = SIH4MPUL
 simplicity = SIHMPLIH4SIXTIY
 simulator = SIH4MYULEYTER
 sin = SIH4N
 single = SIH4NXGUL
 sinister = SIH4NIXSTER
 sir = SER4
 siren = SAY4RIXN
 sit = SIH4T
 situation = SIH5CHUWEY4SHUN
 skeptical = SKEH4PTIXKUL
 sketch = SKEH4TCH
 skill = SKIH4L
 skip = SKIH4P
 slang = SLAE4NX
 sleep = SLIY4P
 sleeve = SLIY4V
 slip = SLIH4P
 slot = SLAA4T
 slow = SLOW4
 small = SMAO4L
 smart = SMAA4RT
 smell = SMEH4L
 smooth = SMUW4DH
 snap = SNAE4P
 so = SOW4
 social = SOW4SHUL
 society = SAXSAY4IXTIY
 soft = SAO4FT
 solar = SOW4LER
 soldier = SOH4LJER
 solemn = SAA4LUM
 solid = SAA4LIXD
 solitude = SAA4LIXTUW6D
 solution = SULUW4SHUN
 some = SAH4M
 somebody = SAH4MBAADIY
 song = SAO4NX
 soon = SUW4N
 sophisticated = SAXFIH4STIXKEYTIXD
 sorry = SAA4RIY

sort = SOH4RT
 sound = SAW4ND
 south = SAW4TH
 space = SPEY4S
 spare = SPEY4R
 spatial = SPEY4SHUL
 speak = SPIY4K
 special = SPEH4SHUL
 specific = SPAXSIH4FIXK
 speculate = SPEH4KYULEYT
 speech = SPIY4CH
 speed = SPIY4D
 spell = SPEH4L
 spend = SPEH4ND
 sphere = SFIY4R
 spin = SPIH4N
 spiral = SPAY4RUL
 spirit = SPIH4RIXT
 splendid = SPLEH4NDIXD
 split = SPLIH4T
 spoil = SPOY4L
 spontaneous = SPAANTEY4NIYAH5
 sports = SPOH4RTS
 spot = SPAA4T
 spread = SPREH4D
 spring = SPRIH4NX
 spy = SPAY4
 square = SKWEH4R
 squeeze = SKWIY4Z
 stability = STAXBIH4LIXTIY
 staff = STAE4F
 stand = STAE4ND
 standard = STAE4NDERD
 star = STAA4R
 start = STAA4RT
 state = STEY4T
 static = STAE4TIXK
 station = STEY4SHUN
 stay = STEY4
 steady = STEH4DIY
 steer = STIY4R
 step = STEH4P
 stereo = STEH4RIYOW
 stick = STIH4K
 stimulate = STIH4MYULEYT
 stock = STAA4K
 stone = STOW4N
 stop = STAA4P
 store = STOH4R
 story = STOH4RIY
 straight = STREY4T
 strange = STREY4NJ

strategy = STRAE4TIXJIY
 street = STRIY4T
 strength = STREY4NTH
 strike = STRAY4K
 strong = STRAO4NX
 structure = STRAH4KCHER
 stubborn = STAH4BERN
 student = STUW4DIXNT
 study = STAH4DIY
 stuff = STAH4F
 stupid = STUX4PIXD
 style = STAY4L
 subject = SAH4BJEHKT
 substance = SAH4BSTIXNS
 subtle = SAH4TUL
 succession = SAHKSEH4SHUN
 succeed = SAHKSIIY4D
 such = SAH4CH
 sudden = SAH4DIXN
 suggest = SAHGJEH4ST
 sum = SAH4M
 summer = SAH4MER
 sun = SAH4N
 super = SUX4PER
 superb = SUXPER4B
 superior = SUXPIH4RIYER
 supply = SAXPLAY4
 support = SAXPOH4RT
 sure = SHUX4R
 surprise = SERPRAY4Z
 surroundings = SERAW4NDIHNXGZ
 suspend = SAHSPEH4ND
 swear = SWEH4R
 sweep = SWIY4P
 swell = SWEH4L
 swing = SWIH4NX
 syllable = SIH4LAXBUL
 symbol = SIH4MBUL
 symbolic = SIHMBAA4LIXK
 symmetric = SIHMEH4TRIXK
 sympathy = SIH4MPAXTHIY
 synchronize = SIH4NXKRAX5NAYZ
 synonym = SIH4NUNIXM
 system = SIH4STUM
 synthesizer = SIH4NTHAXSAYZER

- T -

tab = TAE4B
 table = TEY4BUL
 tactical = TAE4KTIXKUL
 tail = TEY4L

take = TEY4K
 talent = TAE4LIX6NT
 tall = TAO4L
 talk = TAO4K
 tap = TAE4P
 tape = TEY4P
 target = TAA4RGIXT
 task = TEY4ST
 tax = TAE4KS
 teach = TIY4CH
 team = TIY4M
 technical = TEH4KNIXKUL
 technology = TEHKNAA4LAXJIY
 telephone = TEH4LAX6FOWN
 television = TEH4LAX6VIXZHUN
 temper = TEH4MPER
 tender = TEH4NDER
 tense = TEH4NS
 tension = TEH4NSHUN
 term = TER4M
 terminal = TER4MIXNUL
 terrestrial = TER6EH4STRIY6UL
 terrible = TEH4RAXBUL
 territory = TEH4RAXTOH6RIY
 terror = TEH4RER6
 test = TEH4ST
 testimony = TEH4STUMOHNIY
 text = TEH4KST
 than = DHAE4N
 than = DHAE4N
 thank = THAE4NXK
 that = DHAE4T
 the = DHAH4
 theater = THIIY4AHTER
 then = DHEH4N
 theorem = THIIY4RUM
 theory = THIIY4RIY
 thermometer = THERMAA4MIXTER
 thesis = THIIY4SIXS
 they = DHEY4
 thin = THIIH4N
 thing = THIIH4NX
 think = THIIH4NXK
 this = DHIIH4S
 thought = THAO4T
 threshold = THREH4SH/HOWLD
 through = THRUW4
 ticket = TIH4KIXT
 tight = TAY4T
 time = TAY4M
 tiny = TAY4NIY
 tired = TAY4ERD

title = TAY4TUL
 together = TUXGEH4DHER
 tolerance = TAA4LERIXNS
 tone = TOW4N
 tool = TUW4L
 top = TAA4P
 toss = TAO4S
 touch = TAH4CH
 tough = TAH4F
 tournament = TER4NUMIXNT
 toward = TOH4RD
 toward = TOW4RD
 town = TAW4N
 toy = TOY4
 trace = TREY4S
 track = TRAE4K
 trade = TREY4D
 tradition = TRAXDIH4SHUN
 traffic = TRAE4FIXK
 trail = TREY4L
 trajectory = TRAXJEH4KTERY
 transaction = TRAENZAE4KSHUN
 transfer = TRAE4NSFER
 transform = TRAENSFOH4RM
 transistor = TRAENZIH4STER
 translate = TRAE4NZLEYT
 transmit = TRAE4NZMIXT
 transparent = TRAE5NSPEH4RIXNT
 transportation = TRAE5NZPOHRTEY4SHUN
 trap = TRAE4P
 treasury = TREH4ZHERIY
 tree = TRIY4
 trek = TREH4K
 tremendous = TRIKMEH4NDAXS
 trespass = TREH4SPAES
 trial = TRAY4UL
 triangle = TRAY4AENXGUL
 trick = TRIH4K
 trigger = TRIH4GER
 trim = TRIH4M
 trip = TRIH4P
 triple = TRIH4PUL
 triumph = TRAY4AHMF
 troll = TROW4L
 trophy = TROW4FIY
 trouble = TRAH4BUL
 truck = TRAH4K
 true = TRUW4
 truth = TRUW4TH
 try = TRAY4
 tune = TUW4N
 tunnel = TAH4NUL

turn = TER4N
tutor = TUW4TER
twist = TWIH4ST
type = TAY4P
typewriter = TAY4PRAYTER

- U -

ugly = AH4GLIY
ultimate = AH4LTAX6MIXT
uncle = AH4NKUL
under = AH4NDER
understand = AH5NDERSTAE4ND
uniform = YUW4NIXFOHRM
union = YUW4NYUN
unit = YUW4NIXT
universal = YUW5NIXVER4SUL
unless = AHNLEH4S
up = AH4P
upset = AHPSEH4T
urge = EH4RJ
use = YUW4S
utility = YUWTIH4LIXTIY

- V -

vacation = VEYKEY4SHUN
vacuum = VAE4KYUWM
vague = VEY4G
valid = VAE4LIXD
value = VAE4LYUW
valve = VAE4LV
vanadium = VUNEY4DIYUM
vapor = VEY4PER
variation = VEH5RIY4SHUN
various = VEH4RIYAHS
vary = VEH4RIY
veal = VIY4L
vector = VEH4KTER
vegetable = VEH4JTAXBUL
vehicle = VIY4IX6KUL
ventilate = VEH4NTULEYT
verb = VER4B
versatile = VER4SAXTUL
verse = VER4S
version = VER4ZHUN
vertical = VER4TIXKUL
very = VEH4RIY
veto = VIY4TOW
vibration = VAYBREY4SHUN
vicinity = VAXSIH4NIXTIY
victory = VIH4KTERIY

video = VIH4DIYOW
village = VIH4LIXJ
vinyl = VAY4NUL
violation = VAY4AXLEY5SHUN
virtue = VER4CHUW
visible = VIH4ZIXBUL
visit = VIH4ZIXT
vital = VAY4TUL
vocabulary = VOHKA4BYULEHRIY
vocal = VOW4KUL
voice = VOY4S
volt = VOW4LT
volume = VAA4LYUWM
voluntary = VAA4LUNTEH5RIY
vote = VOW4T
vowel = VAW4UL
voyage = VOY4IXJ
video = VIH4DIYOW

- W -

wafer = WEY4FER
wage = WEY4J
wait = WEY4T
wake = WEY4K
walk = WAO4K
wall = WAO4L
war = WOH4R
warm = WOH4RM
warp = WOH4RP
warranty = WOH5RIXNTIY4
wash = WAA4SH
waste = WEY4ST
watch = WAA4CH
water = WAO4TER
watt = WAA4T
wave = WEY4V
way = WEY4
weak = WIY4K
wealth = WEH4LTH
wear = WEH4R
wedding = WEH4DIHNX
week = WIY4K
weight = WEY4
welcome = WEH4LKUM
well = WEH4L
were = WER4
what = WHAH4T
wheel = WHIY4L
when = WHEH4N

which = WHIH4CH
while = WHAY4L
whisper = WHIH4SPER
white = WHAY4T
who = /HUW4
whole = /HOW4L
wide = WAY4D
wild = WAY4LD
will = WIH4L
win = WIH4N
window = WIH4NDOW
wing = WIH4NX
winter = WIH4NTER
wise = WAY4Z
wish = WIH4SH
with = WIH4TH
wizard = WIH4ZERD
woman = WUH4MUN
women = WIH4MIXN
wonder = WAH4NDER
word = WER4D
Wordrace = WER2D REYS
work = WER4K
world = WUH4RLD
worry = WER4IY
would = WUH4D
wrap = RAE4P
write = RAY4T
wrong = RAO4NX

- X -

Zerox = ZIH4RAAKS
X-ray = EH4KSREY
xylophone = ZAY4LAXFOWN

- Y -

yacht = YAA4T
yard = YAA4RD
yawn = YAO4N
year = YIH4R
yellow = YEH4LOW
yes = YEH4S
you = YUW4
your = YOH4R
youth = YUX4TH

- Z -

zany = ZEY4NIY
zero = ZIY4ROW

zig-zag = ZIH3GZAEG
zip = ZIH4P
zodiac = ZOW4DIY6AEK
zone = ZOW4N

- DAYS OF THE WEEK -

Monday = MAH4NDEY
Tuesday = TUW4ZDEY
Wednesday = WEH4NZDEY
Thursday = THER4ZDEY
Friday = FRAY4DEY
Saturday = SAE4TERDEY
Sunday = SAH4NDEY

- MONTHS OF THE YEAR -

January = JAE4NYUXEHRIY
February = FEH4BRUXEH6RIY
March = MAA4RCH
April = EY4PRIXL
May = MEY4
June = JUW4N
July = JUHLAY4
August = AO4GAXST
September = SEHPTEH4MBER
October = AAKTOW4BER
November = NOHVEH4MBER
December = DIHSEH4MBER

- NUMBERS -

one = WAH4N
two = TUW4
three = THRIY4
four = FOH4R
five = FAY4V
six = SIH4KS
seven = SEH4VIXN
eight = EY4T
nine = NAY4N
ten = TEH4N
eleven = IXLEH4VIXN
twelve = TWEH4LV
thirteen = THER4TIY6N
twenty = TWEH4NTIY
thirty = THER4TIY
hundred = /HAH4NDRIXD
thousand = THAW4ZUND
million = MIH4LYUN

- STATES AND PROVINCES -

United States = YUWNAY4TIXD STEY4TS

Alabama = AE4LAXBAE6MAX

Alaska = AHLAE4SKAH

Arizona = EH4RAXZOW5NAH

Arkansas = AA4RKUNSAO

California = KAE5LAXFOH4RNYAH

Colorado = KAA5LAXRAA4DOW

Connecticut = KAHNEH4TIXKAHT

Delaware = DEH4LAXWEH6R

Florida = FLOH4RIXDAH

Georgia = JOH4RJAHA

Hawaii = /HAHWAY4IY

Idaho = AY4DAH/HOW

Illinois = IHLUNOY4

Indiana = IH5NDIYAE4NAH

Iowa = AY4AHWAH

Kansas = KAE4NZIXS

Kentucky = KEHNTAH4KIY

Louisiana = LUXIY4ZIYAE5NAH

Maine = MEY4N

Maryland = MEH4RULIXND

Massachusetts = MAE5SAXCHUW4SIXTS

Michigan = MIH4SAXGUN

Minnesota = MIH5NAXSOW4TAH

Mississippi = MIH5SIXSIH4PIY

Missouri = MIHZUH4RIY

Montana = MAANTAE4NAH

Nebraska = NAXBRAE4SKAH

Nevada = NAXVAE4DAH

New Hampshire = NUW6/HAE4MPSSHER

New Jersey = NUWJER4ZIY

New Mexico = NUWMEH4KSIXKOW

New York = NUWYOH4RK

North Carolina = NOH4RTH

KEH5RULAY4NAH

North Dakota = NOH4RTH DAHKOW4TAH

Ohio = OW/HAY4OW

Oklahoma = OWKLAX6/HOW4MAH

Oregon = OH4RIXGUN

Pennsylvania = PEH5NSULVEY4NYAH

Rhode Island = ROW5D AY4LUND

South Carolina = SAW4TH

KEH5RULAY4NAH

South Dakota = SAW4TH DAXKOW4TAH

Tennessee = TEH5NAXSIY4

Texas = TEH4KSAXS

Utah = YUW4TAO6

Vermont = VERMAA4NT

Virginia = VERJIH4NYAH

Washington = WAA4SHIHNTAHN

West Virginia = WEH5ST VERJIH4NYAH

Wisconsin = WIH5KAA4NSUN

Wyoming = WAYOW4MIHNX

Provinces of Canada =

PRAA4VIXNSIXZ AHV KAE4NAXDAH

Alberta = AELBER4TAH

British Columbia =

BRIH4TIXSH KAHLAH4MBIYAH

Manitoba = MAE5NIXTOW4BAH

New Brunswick = NUWBRAH4NZWIXK

Newfoundland = NUW4FIXNLIXND

Nova Scotia = NOH4VAXSKOW4SHAH

Ontario = AANTEH4RIYOW

Prince Edward Island =

PRIH5NS EH4DWERD AY4LUND

Quebec = KUHBEH4K

Saskatchewan = SAESKAE4CHAXWAAN

- UNITS -

units = YUW4NIXTS

inches = IH4NCHIXZ

feet = FIY4T

yards = YAA4RDZ

miles = MAY4LZ

centimeters = SEH4NTIXMIY6TERZ

kilometers = KIXLAA4MIXTERZ

acres = EY4KERZ

ounces = AW4NSIXZ

pounds = PAW4NDZ

tons = TAH4NZ

grams = GRAE4MZ

teaspoons = TIY4SPUWNZ

cups = KAH4PS

pints = PAY4NTS

quarts = KWOH4RTS

gallons = GAE4LUNZ

liters = LIY4TERZ

degrees = DAXGRIY4Z

FINDING PHONEME SPELLING ERRORS

If you have made a phonetic spelling mistake that causes S.A.M. to be unable to break your string down into phonemes, he will beep twice at you and come back to BASIC without speaking. The location of the bad letter in the string is stored for you to examine. Also, you may PEEK at this location in a program to see if there were any errors in spelling and then make the required changes.

Here is a sample error-checking and display program:

```
100 SAM$ = "MAY VOY4C IHZ BIHZAA5R."  
110 A = USR ( 8192 )  
120 IF PEEK ( 8211 ) > 255 THEN GOSUB 1000:REM ERROR CHECK  
  
1000 REM ERROR DISPLAY — ERROR APPEARS IN INVERSE  
1010 N = PEEK ( 8211 ):REM N IS POSITION OF ERROR  
1020 SAM$(N,N) = CHR$(ASC(SAM$(N,N))+128)  
1030 PRINT SAM$  
1040 RETURN
```

The inverse character marks the spot where S.A.M. could no longer continue reading the string.

TECHNICAL NOTES USE IN BASIC

S.A.M. from BASIC performs all stack housekeeping that is required.

When S.A.M. completes vocal output, the NMIEN (Non-maskable Interrupt Enable) (\$D40E) returns to the following conditions:

BIT 6 — Vertical Blank Interrupt Enable = "on"

BIT 7 — Display List Instruction Interrupt Enable = "on"

All other registers are returned to OS shadow values within 1/60 second after vocal output.

Note that during speech, the VBI is shut down so that the real-time clock registers (18, 19, 20) do not advance.

SCREEN BLANK

The screen blanks during vocal output because Direct Memory Access (DMA) causes gaps to be inserted into the speech waveform each time the 6502 processor waits for the ANTIC chip to access memory. The audible result is extremely distorted speech when the screen is on.

If this speech quality is desirable for some application (or the screen **must** remain on during speech), S.A.M. may be operated in the DMA-enabled mode by POKE-ing a "1" into the "lights" register: **8210**. There are different speed and pitch addresses to be used in this case. To return to DMA-disabled speech, POKE a "0" into this register.

IMPORTANT ADDRESSES

	Decimal	Hex
S.A.M. from Atari BASIC	8192	\$2000
S.A.M. from machine language	8196	\$2004
RECITER from Atari BASIC	8199	\$2007
RECITER from machine language	8203	\$200B
SPEED (LIGHTS OFF)	8208	\$2010
SPEED (LIGHTS ON)	8206	\$200E
PITCH (LIGHTS OFF)	8209	\$2011
PITCH (LIGHTS ON)	8207	\$200F
DMA-enable	8210	\$2012
ERROR	8211	\$2013
ATASCII STRING	8212	\$2014

LISTING OF GUESSNUM

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REM -- GUESSNUM -
20 DIM SAM$(255),B$(50),C$(50)
30 SAM=8192:REM SAM'S ADDRESS
40 GRAPHICS 2:? #6;"GUESS THE NUMBER":? #6;"BETWEEN 1 AND 100"
50 SETCOLOR 2,0,0
60 N=INT(99*RND(0))+1
70 SAM$="GEH3S DHAX NAH4MBER BIXTWIY5N WAH4N Q AEND WAHN6 /HAH4NDRIHD,";A=USR(SAM)
80 TRAP 80:INPUT G
90 IF G>99 THEN SAM$="DHAETS MOH4R DHAEN WAHN /HAH4NDRIXD,";A=USR(SAM);GOTO 80
100 IF G<1 THEN SAM$="DHAETS LEH3S DHAEN WAH5N,";A=USR(SAM);GOTO 80
110 SAM$=""
120 IF G<10 THEN B$="":GOTO 340
130 ON G-9 GOTO 150,160,170,180,190,200,210,220,230,240
140 GOTO 250
150 B$="TEH4N";GOTO 460
160 B$="IHLEH4VIXN";GOTO 460
170 B$="TWEH4LV";GOTO 460
180 B$="THER4TIY6N";GOTO 460
190 B$="FOH4RTIY6N";GOTO 460
200 B$="FIH4FTIY6N";GOTO 460
210 B$="SIH4KSTIY6N";GOTO 460
220 B$="SEH4VUNTIY6N";GOTO 460
230 B$="EY4TIY6N";GOTO 460
240 B$="NAY4NTIY6N";GOTO 460
250 ON INT(G/10)-1 GOTO 260,270,280,290,300,310,320,330
260 B$="TWEH4NTIY6";GOTO 340
270 B$="THER4TIY6";GOTO 340
280 B$="FOH4RTIY6";GOTO 340
290 B$="FIH4FTIY6";GOTO 340
300 B$="SIH4KSTIY6";GOTO 340
310 B$="SEH4VUNTIY6";GOTO 340
320 B$="EY4TIY6";GOTO 340
330 B$="NAY4NTIY6"
340 R=G-10*INT(G/10)
350 IF R=0 THEN GOTO 460
360 ON R GOTO 370,380,390,400,410,420,430,440,450
370 B$(LEN(B$)+1)="WAH5N";GOTO 460
380 B$(LEN(B$)+1)="TUW5";GOTO 460
390 B$(LEN(B$)+1)="THRIYS ";GOTO 460
400 B$(LEN(B$)+1)="FOHR5 ";GOTO 460
410 B$(LEN(B$)+1)="FAY5V ";GOTO 460
420 B$(LEN(B$)+1)="SIH5KS";GOTO 460
430 B$(LEN(B$)+1)="SEH5VUN";GOTO 460
440 B$(LEN(B$)+1)="EY5T";GOTO 460
450 B$(LEN(B$)+1)="NAY5N"
460 IF G>N+25 THEN C$=" IHZ MAH3CH TUW5 /HAY6,";GOTO 530
470 IF G>N+5 THEN C$=" IHZ TUW3 /HAY6,";GOTO 530
480 IF G>N THEN C$=" IHZ AH LIH3TUL TUW4 /HAY6,";GOTO 530
490 IF G<N-25 THEN C$=" IHZ MAH3CH TUW4 LAXOW,";GOTO 530
500 IF G<N-5 THEN C$=" IHZ TUW3 LAXOW,";GOTO 530
510 IF G<N THEN C$=" IHZ AH LIH3TUL TUW4 LAXOW,";GOTO 530
520 IF G=N THEN C$=" YUW3 AAR RAY2IH7T,";GOTO 530
530 SAM$(LEN(SAM$)+1)=B$:SAM$(LEN(SAM$)+1)=C$:A=USR(SAM)
540 IF G<N THEN GOTO 80
550 ? :? :? :? :? :? :GOTO 60

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SELDOM-USED PHONEME COMBINATIONS

Phoneme Combination	You probably want:	Unless it splits syllables like:
GS	GZ e.g. bags	bugspray
BS	BZ e.g. slob	obscene
DS	DZ e.g. suds	Hudson
PZ	PS e.g. slaps	—
TZ	TS e.g. curtsy	—
KZ	KS e.g. fix	—
NG	NXG e.g. singing	ingrate
NK	NXK e.g. bank	Sunkist

FUTURE IMPROVEMENTS

Improvements upon and modifications to the S.A.M. system may occur in the future. Such new versions of S.A.M. will be made available at nominal cost to **registered S.A.M. owners.**

We are also planning to release a new program called "SUPERECITER". RECITER presently has a pronunciation accuracy of about 90%. SUPERECITER will show a major improvement in this area. But, we need your help.

If you hear a word mispronounced by RECITER that you feel is important, jot it down. Send us your list of these words (or proper names) so that we may incorporate them into the expanded rule set of SUPERECITER. Your contributions will be greatly appreciated.

S.A.M. is an ongoing project at DON'T ASK Computer Software. We welcome your comments and suggestions on our software speech synthesis products.

NOTES

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